Plant Assessment Form

For use with the "Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands" by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association (Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial)**:**	*Aegilops cylindrica* Host (USDA 2005)
Synonyms:	*Aegilops cylindrica* Host var. *rubiginosa* Popova, *Aegilops tauschii* auct. non Coss., *Cylindropyrum cylindricum* (Host) A. Löve, *Triticum cylindricum* (Host) Ces., Pass. & Gib. (USDA 2005)
Common names:	Jointed goatgrass, jointgrass
Evaluation date (mm/dd/yy)**:**	12/17/04
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List committee members:	12/17/04: W. Albrecht, D. Backer, D. Crisp, S. Harger, L. Moser 03/02/05: W. Albrecht, S. Harger, L. Moser, F. Northam, T. Olson
Committee review date:	12/17/04 and 03/02/05
List date:	03/02/05
Re-evaluation date(s):	

Table 2. Criteria, Section, and Overall Scores

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	**C**	Observational	**"Impact"** **Section 1 Score:** **C**	**"Plant Score"** **Overall Score:** **Low** **Alert Status:** **None**
1.2	Impact on plant community	**C**	Observational		
1.3	Impact on higher trophic levels	**D**	Observational		
1.4	Impact on genetic integrity	**D**	Other published material		
2.1	Role of anthropogenic and natural disturbance	**C**	Observational	**"Invasiveness"** *For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:* **13 pts** **Section 2 Score:** **B**	
2.2	Local rate of spread with no management	**C**	Observational		
2.3	Recent trend in total area infested within state	**C**	Observational		
2.4	Innate reproductive potential	**A**	Reviewed scientific publication		
2.5	Potential for human-caused dispersal	**A**	Reviewed scientific publication		
2.6	Potential for natural long-distance dispersal	**C**	Observational		
2.7	Other regions invaded	**A**	Observational		RED FLAG YES Something you should know.
3.1	Ecological amplitude	**A**	Observational	**"Distribution"** **Section 3 Score:** **B**	
3.2	Distribution	**D**	Observational		

Red Flag Annotation

Above 1,220 meters (4,000 feet) elevation, *Aegilops cylindrica* can replace native herbaceous and shrub vegetation subsequent to its removal on highly disturbed soil surfaces. *Aegilops cylindrica* infestations alter natural fire regimes during the summer months when wildfires are most likely to occur by increasing fine-fuel loads relative to native vegetation. Roadside populations of *A. cylindrica* connect rights-of way that serve as fire corridors to wildlands and, as a result, increase the risk of wildfires in the wildland-urban

interface. Because *A. cylindrica* can occur as a contaminant in revegetation seed lots, seed mixes should be checked for the presence of this species.

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes *Score:* **C** *Doc'n Level:* **Obs.**
Identify ecosystem processes impacted: Because of dense litter production, wildfire frequency increases at wildland sites where the natural integrity of soil surfaces have been drastically altered by ground disturbances such as road construction/maintenance, grazing animal trampling, fire abatement operations, timber harvesting or hiking/camping activities (F. Northam, personal communication, 2005).
Rationale: A literature review by Donald and Ogg (1991) reported jointed goatgrass infestations in Oregon winter wheat fields ranging from 54 to 86 plants/m^2. Anderson (1993) reported plants averaged 23 tillers (stems)/plant in a Colorado wheat field having 18 plants/m^2. White et al. (2004) reported typical jointed goatgrass tiller densities ranging from 260 to 370/m^2in Kansas winter wheat following a wet summer fall and spring. Therefore, jointed goatgrass is capable of producing multi stemmed, plants and population densities that exceed one plant per square foot in intensely disturbed soil such as crop land. Arizona jointed goatgrass populations ranging from 10 to 20 plants/m^2with15 to 30 tillers/plant have been observed along Arizona rights-of-ways (Northam, personal communication, 2005). If populations of *Aegilops cylindrica* establish in intensely disturbed wildland soil, we infer this grass will produce sufficient litter to carry fire from infested sites into adjacent native plant communities.
Sources of information: See cited literature. Also considered personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003) and inference by Working Group members.

Question 1.2 Impact on plant community composition, structure, and interactions *Score:* **C** *Doc'n Level:* **Obs.**
Identify type of impact or alteration: Alteration of native plant community composition and structure may occur where dense jointed goatgrass populations add a litter layer to the soil surface and provides fuel for wildfire movement into adjacent vegetation.
Rationale: Most Arizona jointed goatgrass herbarium specimens were collected from areas subjected to periodic soil disturbance such as road rights-of-way, urban land, vehicle parking areas, public parks and other recreational sites (SIENet 2004). Recent observations of established *A. cylindrica* populations in northern Arizona highway rights-of-way, vacant lots and abandoned cultivated ground indicate this species is capable of becoming a predominate herbaceous species at sites where soil surfaces are intensely modified (F. Northam, personal communication, 2005). Thus, wildland sites where soils are severely degraded by construction machinery, animal hooves, reclamation/ restoration implements, off-road recreational vehicles, mining debris disposal, logging operations or wildfires are favorable environments for jointed goatgrass infestations. By inference it was determined *A. cylindrica* populations in Arizona may establish fire hazards due to dead plants becoming a combustible litter/thatch layer in June and July.
Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed December 10, 2004), personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003), and inference by Working Group members.

Question 1.3 Impact on higher trophic levels *Score:* **D** *Doc'n Level:* **Obs.**
Identify type of impact or alteration: Possible forage for grazing animals.
Rationale: Donald and Ogg (1991) reported herbage of jointed goatgrass in Oklahoma winter wheat used for cattle pasture was grazed along with wheat herbage. Possibly roadside populations in northern Arizona will provide forage for elk and deer. However, since *A. cylindrica* populations currently cover small areas, it is inferred that the impact is minimal.
Sources of information: See cited literature. Working Group members also applied inference in determining the appropriate score.

Question 1.4 Impact on genetic integrity *Score:* **D** *Doc'n Level:* **Other pub.**
Identify impacts: No native plants in the same genus are known to exist in Arizona (Kearney and Peebles 1960).
Rationale: Jointed goatgrass is known to hybridize with wheat (*Triticum aestivum* L.), but field crosses produce sterile spikelets (Donald and Ogg 1991). No information was found indicating cross-pollination between native Arizona plants and jointed goatgrass.
Sources of information: See cited literature.

Question 2.1 Role of anthropogenic and natural disturbance in establishment *Score:* **C** *Doc'n Level*: **Obs.**
Describe role of disturbance: Disturbances that disrupt the integrity of soil surfaces and eliminate most plant cover is needed for jointed goatgrass propagules to produce enough litter to become wildfire hazards (F. Northam, personal communication, 2005).
Rationale: Donald and Ogg (1991) estimated 2.5 to 3 million acres of U.S. winter wheat cropland was infested with jointed goatgrass. Likewise, they reported rangeland adjacent to infested wheat fields were also infested and previous croplands planted to native grasses for the Conservation Reserve Program were infested. Beck et al. (1995) reported germination of weed seed from previous cropping operations impaired perennial grass establishment in grass restoration plantings on Colorado wheat cropland. Observations of established jointed goatgrass populations in Arizona indicated this species infests sites where soil surfaces were altered by human activities. Numerous activities can produce this type of alteration in wildland soils including road/trail maintenance, homestead abandonment, livestock watering facilities, bulldozed fire lines, saltcedar / juniper removal, cultivating revegetation sites, ATV races, timber removal, hazardous material cleanup, etc. In other words, small areas within wildlands where anthropogenic activities damage soil, the ground is opened up to *A. cylindrica* infestations and possible wildfire damage (F. Northam, personal communication, 2005).
Sources of information: See cited literature. Also considered personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 2.2 Local rate of spread with no management *Score:* **C** *Doc'n Level:* **Obs.**
Describe rate of spread: Stable
Rationale: Roadside infestations are increasing, but less than doubling in 10 years; no populations are known to be spreading into natural areas where minor or no disruption of soil surfaces has occurred (F. Northam, personal communication, 2005).
Sources of information: Personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 2.3 Recent trend in total area infested within state *Score:* **C** *Doc'n Level:* **Obs.**
Describe trend: Herbarium collections began in 1940, and all were in the northern 1/3 of the state except for two in Ramsey Canyon area (Huachuca Mountains) of southwest Cochise County (SEINet 2004). Recent surveys have not reported new populations (F. Northam, personal communication, 2005).
Rationale: Herbarium collections are from sites above 4000 feet and most are in northern Arizona and above 5000 feet. Only two of 42 *A. cylindrica* specimens are farther south than northern Gila County (SEINet 2004). Observations during Arizona Department of Agriculture Noxious Weed surveys from 2000 to 2003 did not find populations in any other counties (F. Northam, personal communication, 2005). No reports, specimens or surveys have discovered jointed goatgrass below 3000 feet.
Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed December 10, 2004)and personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 2.4 Innate reproductive potential *Score:* **A** *Doc'n Level:* **Rev. sci. pub.**
Describe key reproductive characteristics: Seeds (caryopses) are the only way this winter annual species reproduces. No vegetative reproduction or multi-season seed crops.
Rationale: Gealy (1988) reported *A. cylindrica* plants grown in the field without competition produced 69 spikes (seedheads) per plant and 8.9 spikelets (joints) per spike which totaled approximately 600 spikelets per plant. Nine accessions from eight western states were evaluated. Anderson (1995) grew jointed goatgrass plants in Colorado winter wheat crops which averaged 20 tillers and 170 spikelets per plant. Arizona populations densities exceeding 10 plants per m^2 and 8 tillers per plant averaging 8 "joints" per tiller with two seed per joint can easily produce >1000 seed per m^2 (F. Northam, personal communication, 2005).
Sources of information: See cited literature. Also considered personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 2.5 Potential for human-caused dispersal *Score:* **A** *Doc'n Level:* **Rev. sci. pub.**
Identify dispersal mechanisms: Contaminated planting seed of winter wheat and winter grass seed used for restoration projects, contaminated wheat straw used for mulch in reseeding projects such as fire rehabilitation, contaminated grain transported in uncovered trucks, contaminated farm and restoration/ reclamation equipment (combines, drills, root plows, etc.), and contaminated hay harvested from pastures seeded with winter grass forages.
Rationale: Jointed goatgrass spikes (tillers) can grow up to 70 cm tall in low density pure stands (Gealy 1988) and up to 1.2 meters tall in winter wheat crops. Donald and Ogg (1991) described the economic impact of *A. cylindrica* contamination in harvested wheat grain and contaminated transport equipment. Many seed production fields for perennial winter grasses and cover crop species used to combat soil erosion following wild fires are grown in states where *A. cylindrica* is a major winter cereal crop weed; normal plant heights of this species are tall enough to be harvested with grain or planting seed (F. Northam, personal communication, 2005). Likewise, straw used as reclamation mulch from jointed goatgrass infested wheat regions is another potential source of importation of this weed into Arizona (F. Northam, personal communication, 2005). Several patches of *A. cylindrica* on Arizona highway rights-of-way exhibit distribution patterns that would be expected if contaminated seed or straw mulches were spread on roadside restoration projects (F. Northam, personal communication, 2005).
Sources of information: See cited literature. Also considered personal communication with F.

Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003)

Question 2.6 Potential for natural long-distance dispersal *Score:* **C** *Doc'n Level:* **Obs.**
Identify dispersal mechanisms: Movement by runoff water following precipitation events.
Rationale: Dry, mature jointed goatgrass joints float in water and can move >1 km in rain runoff or irrigation water shortly after spikes disarticulate in June and July (F. Northam, personal communication, 2005).
Sources of information: Personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 2.7 Other regions invaded *Score:* **A** *Doc'n Level:* **Obs.**
Identify other regions: Land with notable soil surface alteration (such as winter grain fields, road rights-of-way, vacant urban lots, pastures or grassland restoration plantings) are the predominate habitats for *A. cylindrica* infestations within the following regions: Pacific Northwest Palouse Prairie; Central Plains Shortgrass Prairie; Midwestern Tall Grass Prairie; Eastern Deciduous Forest and Great Basin Deserts (Welsh et al. 1987).
Rationale: Semi-arid regions with 10 to 20 inches of annual precipitation appear to be highly susceptible to *A. cylindrica* encroachment (Donald and Ogg 1991). Based on observations of current jointed goatgrass presence in Arizona, land above 4000 feet with at least 10 inch/year precipitation and having soil surfaces disrupted to the point that most native herbaceous plant species are absent appear to be susceptible to intrusion by this non-native plant (F. Northam, personal communication, 2005). Based on the preceding information, it can be inferred future that soil disturbance in several non-infested vegetation zones of southeast Arizona will open potential sites for *A. cylindrica* colonization including: Chihuahuan desertscrub; montane riparian, Maderan evergreen woodlandm, and semi-desert grasslands. Two herbarium specimens from the Huachuca Mountains in southwest Cochise County support this deduction.
Sources of information: See cited literature. Working Group members also applied inference in determining the appropriate score.

Question 3.1 Ecological amplitude *Score:* **A** *Doc'n Level:* **Obs.**
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: According to the SEINet (2004) website, Arizona jointed goatgrass collections have come from southwestern interior chaparral, Great Basin desertscrub, semi-desert grassland, Great Basin conifer woodland, and montane conifer forest minor ecological types.
Rationale: Collections and observations of established jointed goatgrass populations in wildland areas have been on sites in which native vegetation has been subjected to intense disturbance by wildfires, road construction / maintenance operations, restoration / reclamation projects, abusive grazing or public recreational construction. No sites are known where jointed goatgrass has moved into mostly undisturbed vegetation (F. Northam, personal communication, 2005; SEINet 2004).
Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed December 10, 2004)and personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).

Question 3.2 Distribution	*Score:* **D** *Doc'n Level:* **Obs.**
Describe distribution: Collections and observations of established *A. cylindrica* populations in wildland areas have been on sites in which native vegetation has been disturbed by wildfires, road construction / maintenance operations, restoration / reclamation projects, abusive grazing, logging activities, or public recreational construction. As a result, distribution within individual ecological types has been limited to date.	
Rationale: Arizona *A. cylindrica* populations ranging from 10 to 20 plants/m^2 with15 to 30 tillers/plant have been observed along rights-of-ways adjacent to wildlands. In other words, this species has been observed producing sufficient litter in disturbed areas to be a wildfire threat to native plants adjacent to litter patches. However, no sites are known where jointed goatgrass has encroached into mostly undisturbed vegetation (F. Northam, personal communication, 2005).	
Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed December 10, 2004)and personal communication with F. Northam (Weed Biologist, Consultant, 2005; field observations made while serving as the Arizona Department of Agriculture, Noxious Weed Program Coordinator during 2000 to 2003).	

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	**Yes**	**No**	**1 pt.**
Dense infestations produce >1,000 viable seed per square meter	**Yes**	**No**	**2 pt.**
Populations of this species produce seeds every year.	**Yes**	**No**	**1 pt.**
Seed production sustained for 3 or more months within a population annually	**Yes**	**No**	**1 pt.**
Seeds remain viable in soil for three or more years	**Yes**	**No**	**2 pt.**
Viable seed produced with *both* self-pollination and cross-pollination	**Yes**	**No**	**1 pt.**
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	**Yes**	**No**	**1 pt.**
Fragments easily and fragments can become established elsewhere	**Yes**	**No**	**2 pt.**
Resprouts readily when cut, grazed, or burned	**Yes**	**No**	**1 pt.**

Total pts: 6 Total unknowns: 1

Score : A

Note any related traits:

Worksheet B. Arizona Ecological Types

(*sensu* Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	**D**
Desertlands	Great Basin desertscrub	**D**
	Mohave desertscrub	
	Chihuahuan desertscrub	
	Sonoran desertscrub	
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	**D**
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	
	montane riparian	
Woodlands	Great Basin conifer woodland	**D**
	Madrean evergreen woodland	
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	**D**
Tundra (alpine)	tundra (alpine)	

*A means >50% of type occurrences are invaded; B means >20% to 50%; C means >5% to 20%; D means present but ≤5%; U means unknown (unable to estimate percentage of occurrences invaded).

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